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**The Patent Office**  
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NEWPORT NP9 1RH

**Request for Grant of a Patent**

1. Your reference

P46514/JEP

2. Patent Application number  
(the Patent Office will fill in this part)

**9915384.3**

- 2 JUL 1999

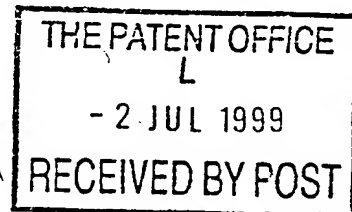
3. Full name, address and postcode of the or  
of each Applicant (underline all surnames)

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Patent Office ADP Number (if you know it)

If the applicant is a corporate body, give  
the country/state of its incorporation

7257397001



4. Title of the Invention

LOAD HANDLING APPARATUS

5. Name of your Agent (if you have one)

URQUHART-DYKES & LORD

"Address for Service" in the United Kingdom to  
which all correspondence should be sent  
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Tower House  
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Patents ADP Number (if you know it)

1644004

6. If you are declaring priority from one or more  
earlier Patent Applications, give the country  
and the date of filing of the or of each of these  
earlier Applications and (if you know it) the or each

Country

Priority application No.  
(if you know it)

Date of Filing  
(Day/month/year)

7. If this Application is divided or otherwise derived  
from an earlier UK Application, give the Number  
and the Filing Date of the earlier Application

Number of earlier application

Date of Filing  
(Day/month/year)

8. Is a Statement of Inventorship and of Right to  
Grant of a Patent required in support of this  
request ?

No

(Answer 'Yes' if:

- a) any Applicant named in part.3 is not an inventor, or
- b) there is an inventor who is not named as an Applicant, or
- c) any named Applicant is a corporate body.)

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this Form. Do not count copies of the same document

Continuation sheet of this Form

Description

6

Claim(s)

Abstract

Drawing(s)

14

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10. If you are also filing any of the following state how many against each item

Priority documents

Translations of priority documents

Statement of Inventorship and Right to Grant a Patent (*Patents Form 7/77*)

Request for Preliminary Examination (*Patents Form 9/77*)

Request for Substantive Examination (*Patents Form 10/77*)

Any other documents (*please specify*)

11.

I/We request the grant of a Patent on the basis of this Application

Signature

Date

Urquhart-Dykes & Lord.

URQUHART-DYKES & LORD 1 July 1999

12. Name and daytime telephone number of person to contact in the United Kingdom

J E PERRY  
0113 245 2388

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## LOAD HANDLING APPARATUS

The present invention relates to apparatus for handling loads, particular for lifting , positioning and/or tilting large or small and/or heavy loads.

6 According to a first aspect of the present invention, there is provided load handling  
apparatus comprising at least one first elongate member having means for engaging a load  
and at least one second elongate member pivotally connected to said first-mentioned  
elongate member, and actuating means cooperating with said first and second elongate  
11 members to change the angular orientation of said first and second elongate members  
relative to each other.

The first member may engage directly with the load to be handled, or with additional  
elongate members disposed so as to transmit the relative movement of said first and second  
members to the load, which is thereby manipulated as required.

16 In its basic embodiment, the at least one first member is about twice the length of said at  
least one second member, but the invention also encompasses a variant in which the two  
members are of equal length. This latter embodiment may be achieved by affixing to the  
second member an extension member which lengthens the first member to a length which is  
equal to the second member.

It is preferred that said "at least one" first and second members actually each comprise a  
pair of members, which will hereinafter be referred to as the first pair and the second pair  
respectively, each member of each pair being disposed generally parallel to the other  
26 member of the same pair and the two pairs being connected together by means of a pivot  
rod.

The actuating means may comprise a hydraulic or pneumatic mechanism, but it is preferred  
that the actuating means comprises an airbag which can be inflated by means of an airline,  
31 high pressure air bottle, battery operated compressor or the like. Alternatively, the airbag

1 may be connected via suitable coupling means to a bolt-on air reservoir, such that the  
apparatus may be converted into a low profile self-levelling apparatus.

The airbag is conveniently disposed close to the point of pivotal connection between said  
first and second arms and is constructed such that inflation of the bag will cause a greater  
6 degree of inflation in the distal regions of the back furthest away from the pivotal  
connection and a much lesser degree of inflation in the proximal region closest to the  
pivotal connection. Thus, the distal edge of the airbag inflates over an arc which is typically  
up to 90 degrees, such that the degree of tilt thereby imparted is up to 45 degrees.

11 Preferably, a lifting plate extends between the first pair of arms, which may also include  
means for connecting an attachment at an upper end thereof. Instead or in addition, a lifting  
table or platform may extend between the first and second pairs of arms (in the case where  
these are of equal length), to provide low profile vertical lifting upon inflation of the airbag.

16 However, the actuating means may alternatively be a hydraulically operated wedge device  
which may be driven laterally to achieve the same result.

According to a second aspect of the present invention there is provided an airbag having a  
number of interconnecting compartments, wherein inflation of the airbag is restrained at one  
21 edge or part thereof.

According to a third aspect of the present invention there is provided load handling  
apparatus comprising at least one first elongate member having means for engaging a load  
and at least one second elongate member pivotally connected to said first-mentioned  
26 elongate member, and an airbag cooperating with said first and second elongate members to  
change the angular orientation of said first and second elongate members relative to each  
other upon inflation/deflation of the airbag.

Embodiments of the present invention will now be described, by way of example only, with  
31 reference to the accompanying drawings, in which:

Figure 1 illustrates one embodiment of the first aspect of the invention,

Figure 1A illustrates a variant of the embodiment of Figure 1,

Figure 2 is a plan view of the apparatus of Figure 1,

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6

Figure 2A is a plan view of the embodiment of Figure 1A,

Figure 2B illustrates the extension member for connection to the apparatus shown in Figure 1,

11

Figure 3 illustrates a further embodiment of the first aspect of the invention,

Figure 4 is a plan view of the apparatus of Figure 3,

16

Figure 5 illustrates the use of a horizontal lifting platform,

Figure 6 is a plan view of the apparatus of Figure 5,

Figure 7 illustrates the use of multiple units of the apparatus of Figures 3 and 4,

Figure 8 illustrates the use of the unit of Figures 3 and 4 combined with the unit of Figures 1 and 2,

Figure 9 illustrates the use of the apparatus to discharge the contents of a container,

26

Figure 10 illustrates the use of an attachment,

Figures 11, 12 and 13 illustrate the method of construction of the airbag,

31

Figure 14 is a section through the constructed airbag,

1 Figure 15 illustrates schematically the inflation of the airbag of Figure 14,

Figure 16 illustrates the arrangement of Figure 1 but incorporating hydraulic actuating means in place of the airbag,

6

Figure 17 is a plan view of the apparatus of Figure 16, and

Figures 18 through 20 illustrate the operation of the hydraulic mechanism.

11 Referring to Figures 1 and 2 of the drawings, a first pair of members 3 are pivotally  
connected, along pivot rod 7 (which may also hold the airbag to be described in detail  
later), to a second pair of members 10 of much shorter length than members 3 and  
terminating in free end 11 which has holes 11a or other fixing means to allow attachment of  
various accessories thereto. A top heavy duty or reinforced lifting plate 4 is disposed  
16 between and attached to the upper regions of members 3 for engaging with a load, and a  
bottom reinforced lifting plate 2 is similarly disposed between and attached to the lower  
regions of members 10. The bottom edges of members 3 and 10 bear ground-engaging  
pairs of rollers 6 attached to the members by means of pivot pins 5. One of the roller pairs  
is fixed, the other slides horizontally. In Figures 1A and 2A, a platform, lifting device or  
21 order-picking device indicated schematically at 40 is fixed to the upper end of member 3.

Figure 2B illustrates an extension member 11b which is secured to end 11 of member 10  
(see Figure 1) to form the embodiment shown in Figure 3.

26 In Figures 3 and 4, the second pair of members 1 are of the same length as members 3, this  
arrangement being suitable for the addition of a top table 8. Each of the upper ends of  
members 3 are pivotally connected to the underneath surface of top table 8 whilst the  
upper ends of members 1 travel horizontally as the apparatus is operated. Also shown in  
Figure 5 is an inflatable airbag 9, which is a multi-compartment airbag according to the  
31 second aspect of the present invention, the airbag 9 being inflated to effect load handling.  
The airbag 9 is fixed to the pivot rod 7 by means of airbag holding strap 13.



In Figure 7, two units each comprising pairs of members 1,3 are linked together by pivot pins 5 to give greater height, the airbag 9 being disposed between the members of the lowermost unit.

In Figure 8, a unit comprising members 1,3 has connected on top of it, by means of pivot pins 5, a unit comprising members 3,10. The load 40 is supported between the uppermost pair of members 3, either on plate 4 or on the members themselves, and is secured against sliding off by removable stop means 18. At the base of the apparatus, rollers 6 travel within a base frame 12, the latter incorporating an anti-tilt locking device (not shown). The base frame 12 is itself mounted on wheels 42 and includes a towing bracket 15 so that the whole apparatus may readily be moved around as required.

In Figure 9, the same basic arrangement as shown in Figure 8 is illustrated, this time with an extended flexible chute 21 extending from the upper surface of uppermost members 3. This variant is particularly suitable for discharging the contents of a container. A removable pivoting tilt stopper 20 is attached to members 3 as shown.

In Figure 10, the upper end of uppermost member has connected thereto a pivoting accessory attachment holder 17 which cooperates with support bar 22 to engage an accessory 23. The accessory 23 may be, for example, the functional equivalent of the blades of a fork lift truck, or loading platform, or stand-on platform such as is provided in conventional order-picking devices. The airbag is deflated to allow the bracket 23 to be engaged beneath the load to be lifted, and then inflated to lift the load. The interconnection of members 1,3 and 10 are such that the forces are transmitted along the apparatus in such a manner as to counterbalance the load, thus avoiding overturning. Another major advantage of the apparatus shown in Figure 10 is that the apparatus, having no permanently extended support arms, can be more readily manipulated in for example solid wall loading bays.

Figures 11 through 14 illustrate the method of construction of the airbag, which comprises alternate large and small sheets 1, 2 respectively joined by radio-frequency welding along lines 6,6a, B and C. Corner reinforcements 5 serve to stabilise and strengthen the corners of the finished bag..

1 The sheets 1 and 2 have a central hole 8 therein surrounded by radio-frequency weld line 7, this hole serving to allow the air pumped into the bag from inlet 12 to rapidly fill the whole bag during inflation.

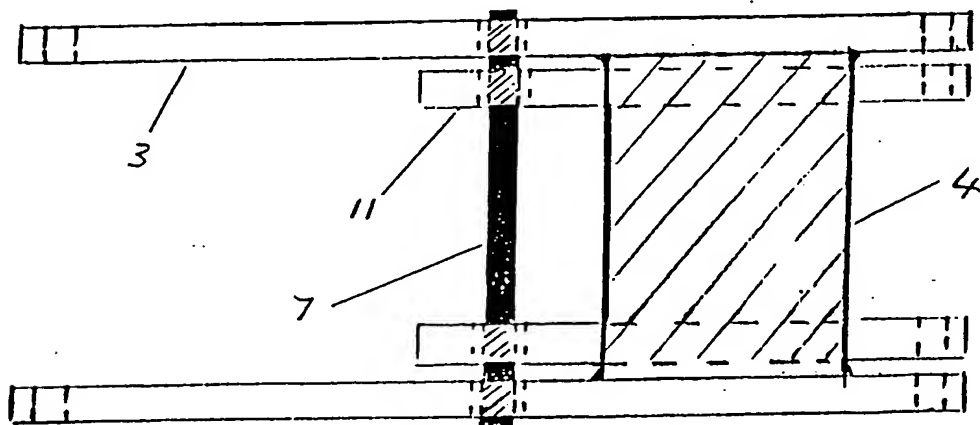
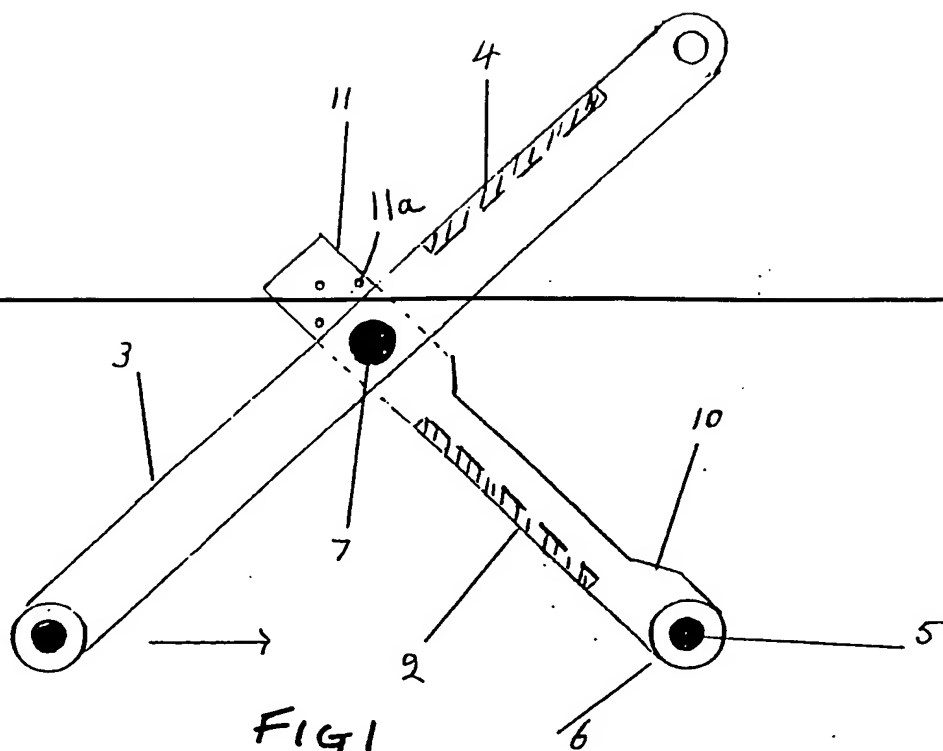
6 Large and small retaining straps 4, 4a are welded to the large sheets 1 as shown in Figure 13, along radio-frequency weld lines 3, and the airbag is bounded by small bottom sheet 9 and large top sheet 10, both without holes.

11 As can be seen in Figure 15, inflation of the bag by pumping air in through inlet 12 causes the bag to inflate as shown, with one side being restrained against inflation by means of retaining straps 4, 4a which are secured to bar 7. To deflate the bag, the air is simply let out of outlet 13 and the weight of the load returns the airbag to the deflated condition.

16 In Figures 16 through 20, an alternative actuating means is illustrated, which comprises a hydraulic/pneumatic actuator 30. This comprises hydraulic/pneumatic cylinder 31 with a rear clevis 32 which mounts the cylinder onto the pivot rod 7. A rod 33 is extended and retracted relative to the cylinder 31, and top and bottom actuators 34, 34a respectively are pivotally mounted to the rod at hinge 35 with the free ends of actuators 34, 34a being preferably pivotally connected to members 3, 10 respectively of the handling apparatus. In the closed position as shown in Figure 18, the rod 33 is fully extended out of cylinder 31 and actuators 34, 34a lie flat against rod 33. However, upon retraction of rod 33 within cylinder 31 the actuators 34, 34a are forced, by virtue of their pivotal connection to members 3, 10 to pivot as shown in Figure 19 which represents the open position, thereby forcing members 3, 10 apart. Such an arrangement would require a hydraulic reservoir and motor, both of which would be located outside of the apparatus and are not illustrated in the drawings.

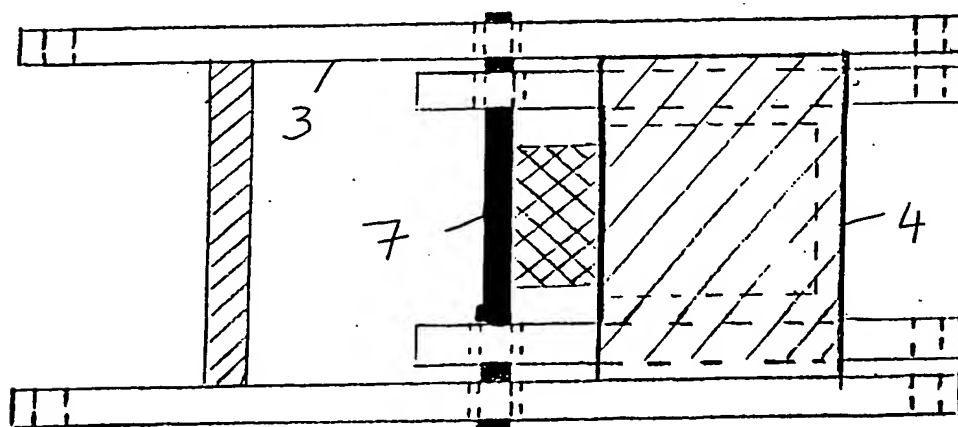
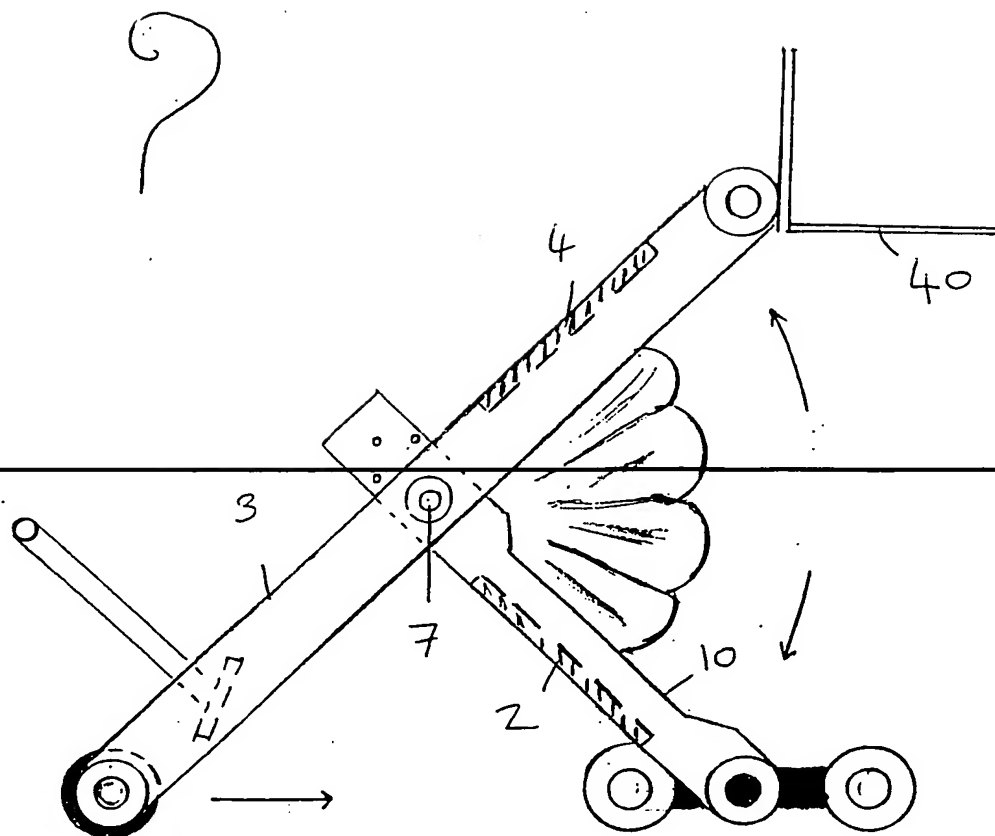
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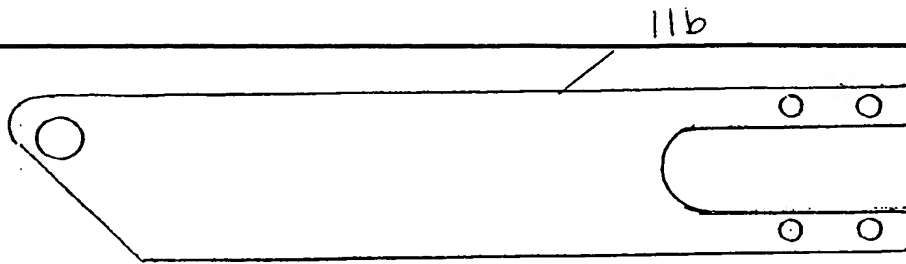


FIG 2B

REMOVABLE INNER TOP LEG (ITEM 11A P)

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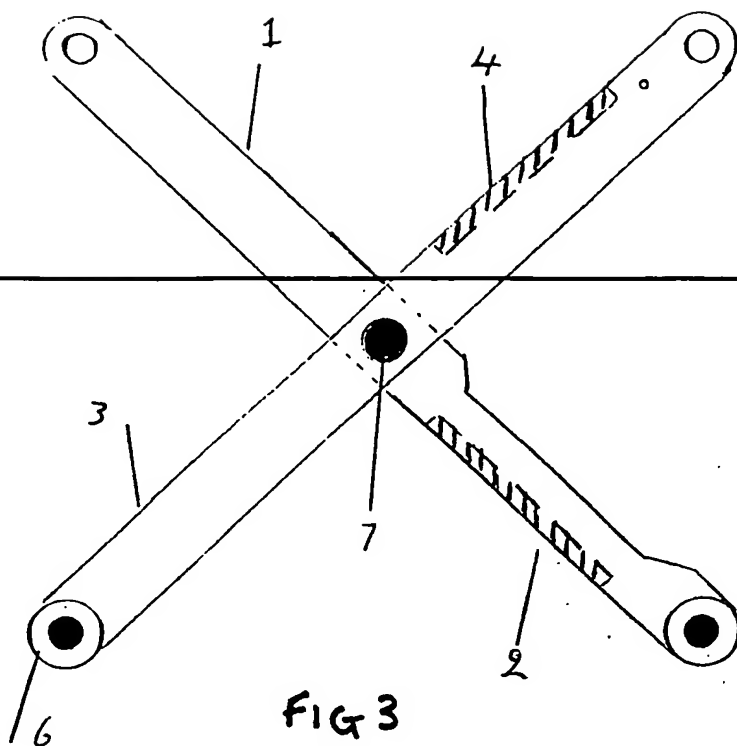


FIG 3

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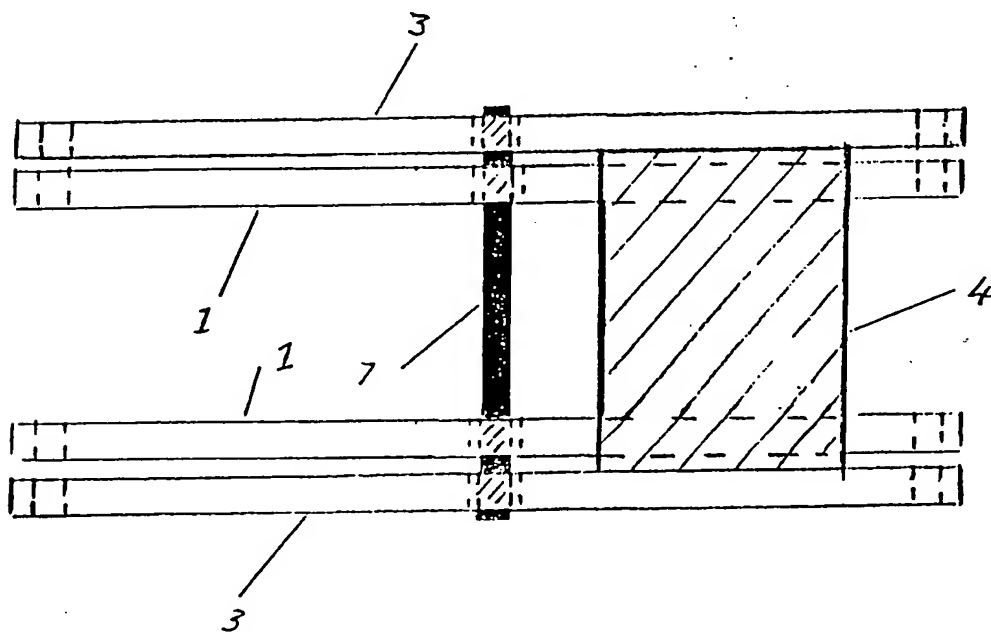


FIG 4

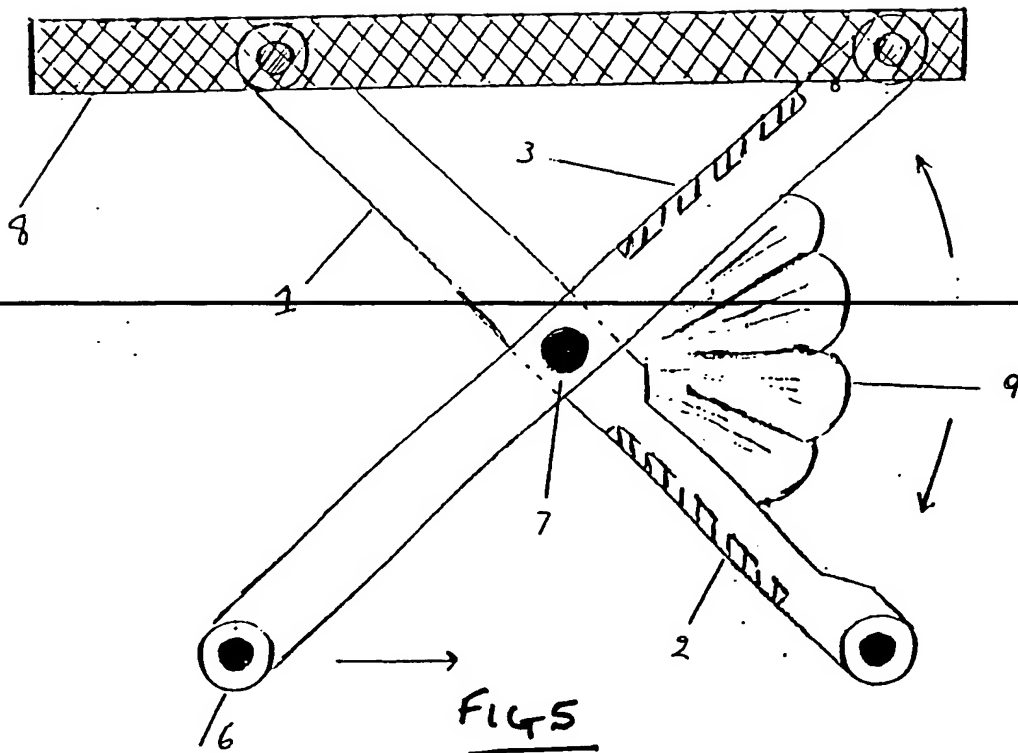
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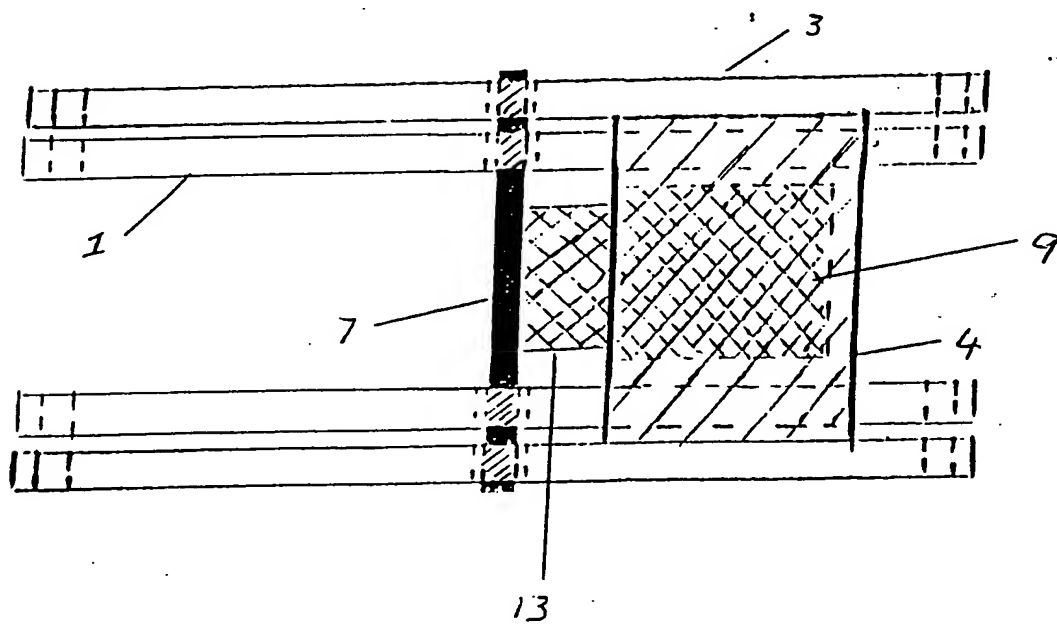
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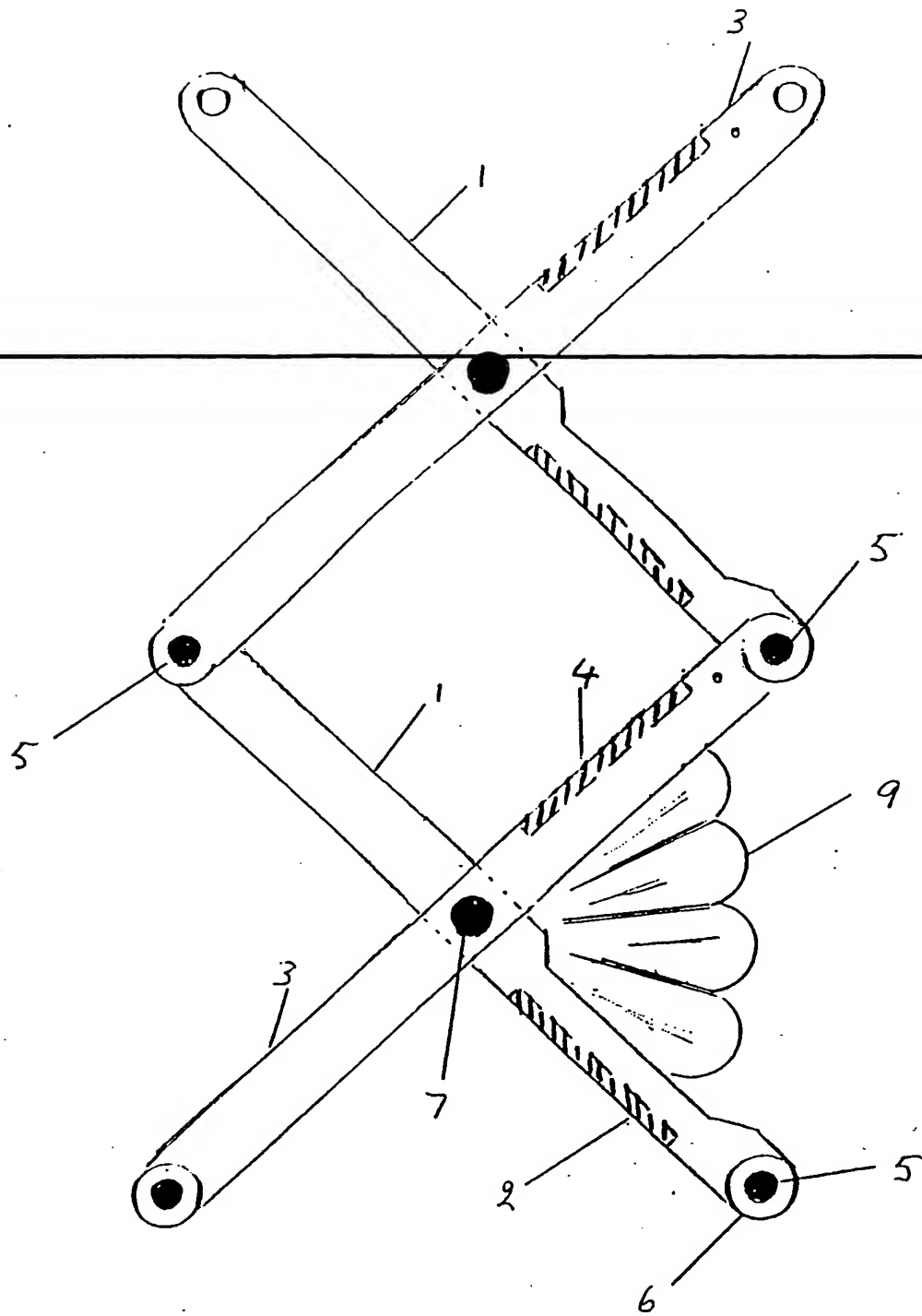


FIG 7

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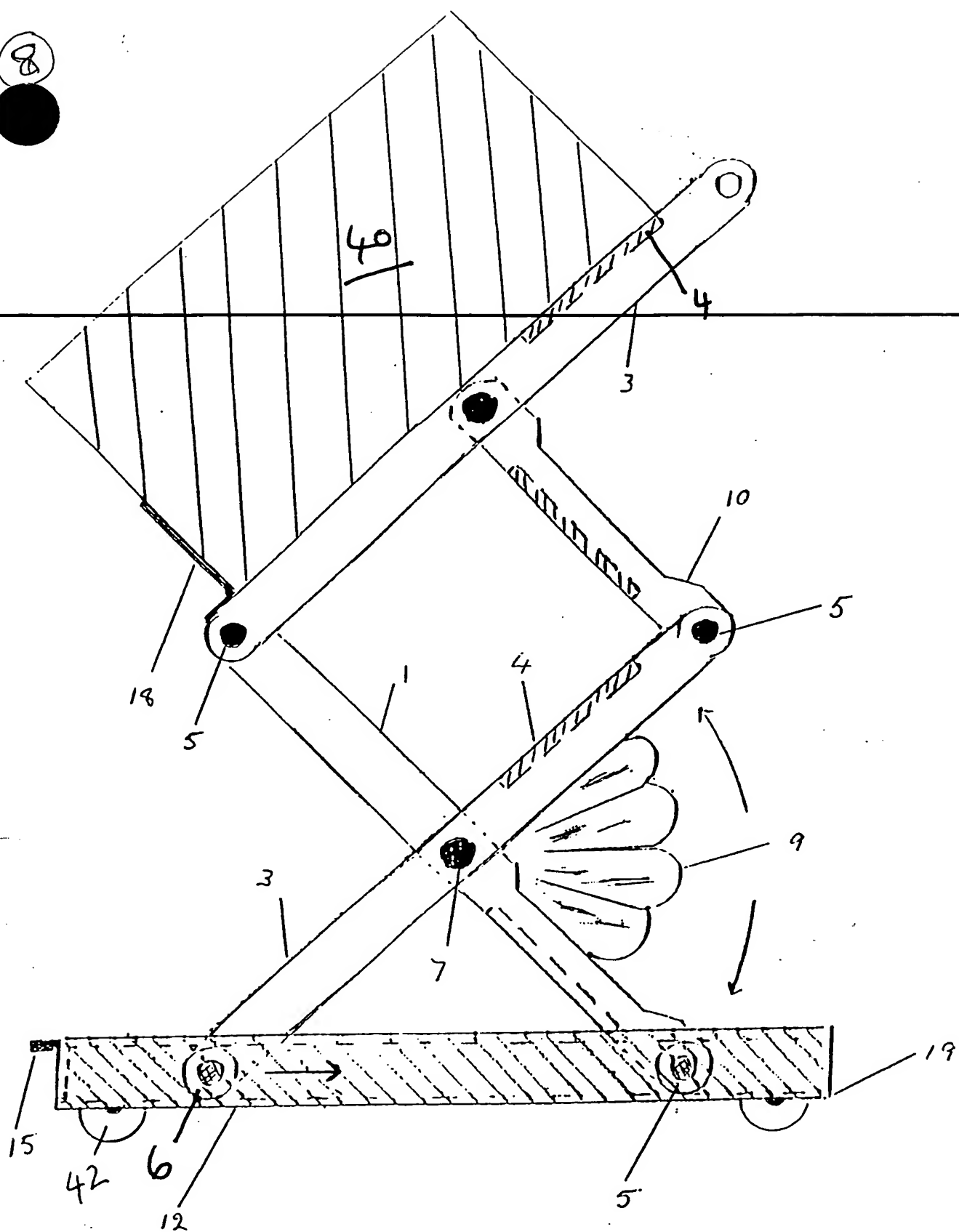


FIG 8

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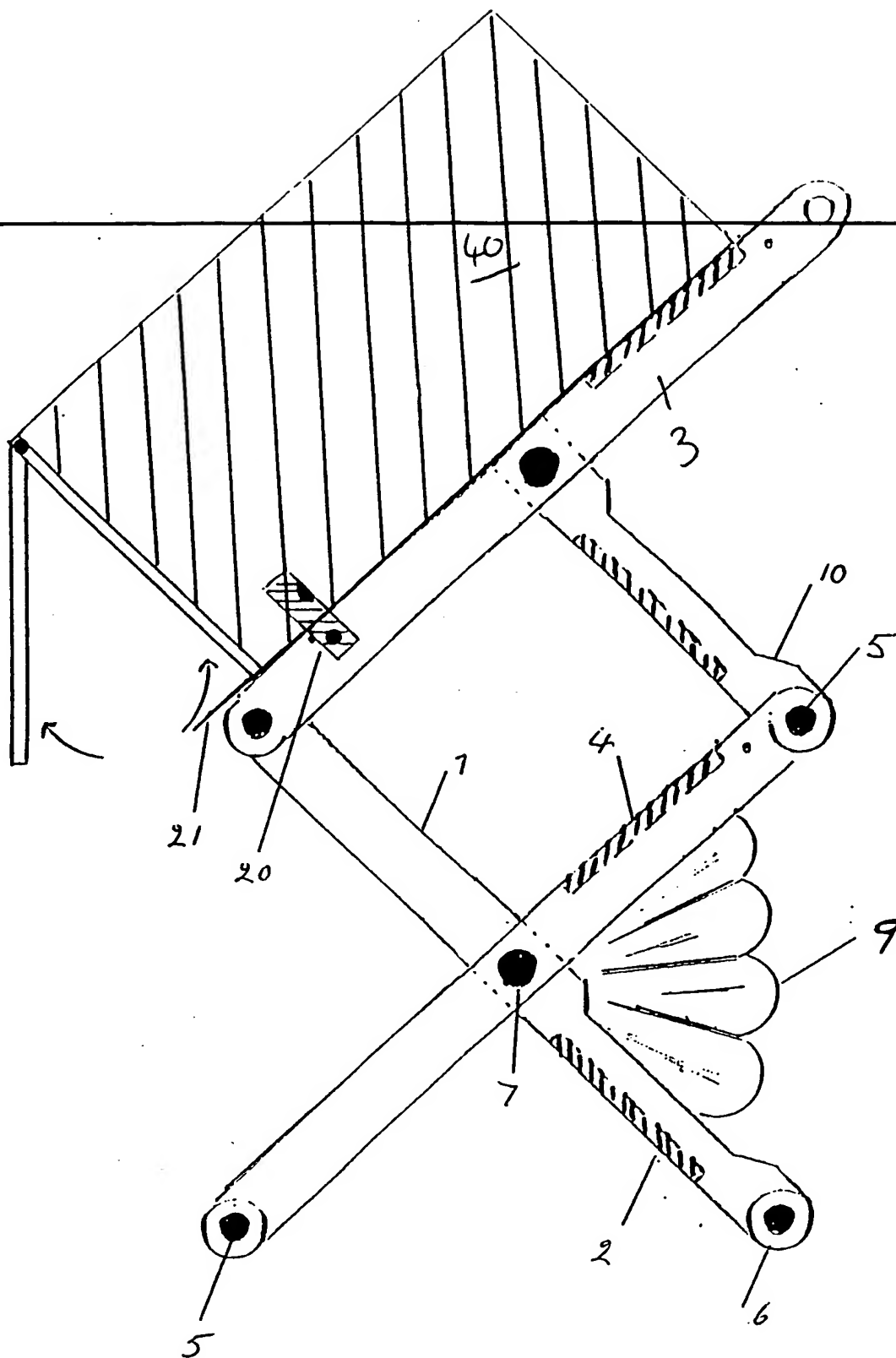


FIG 9

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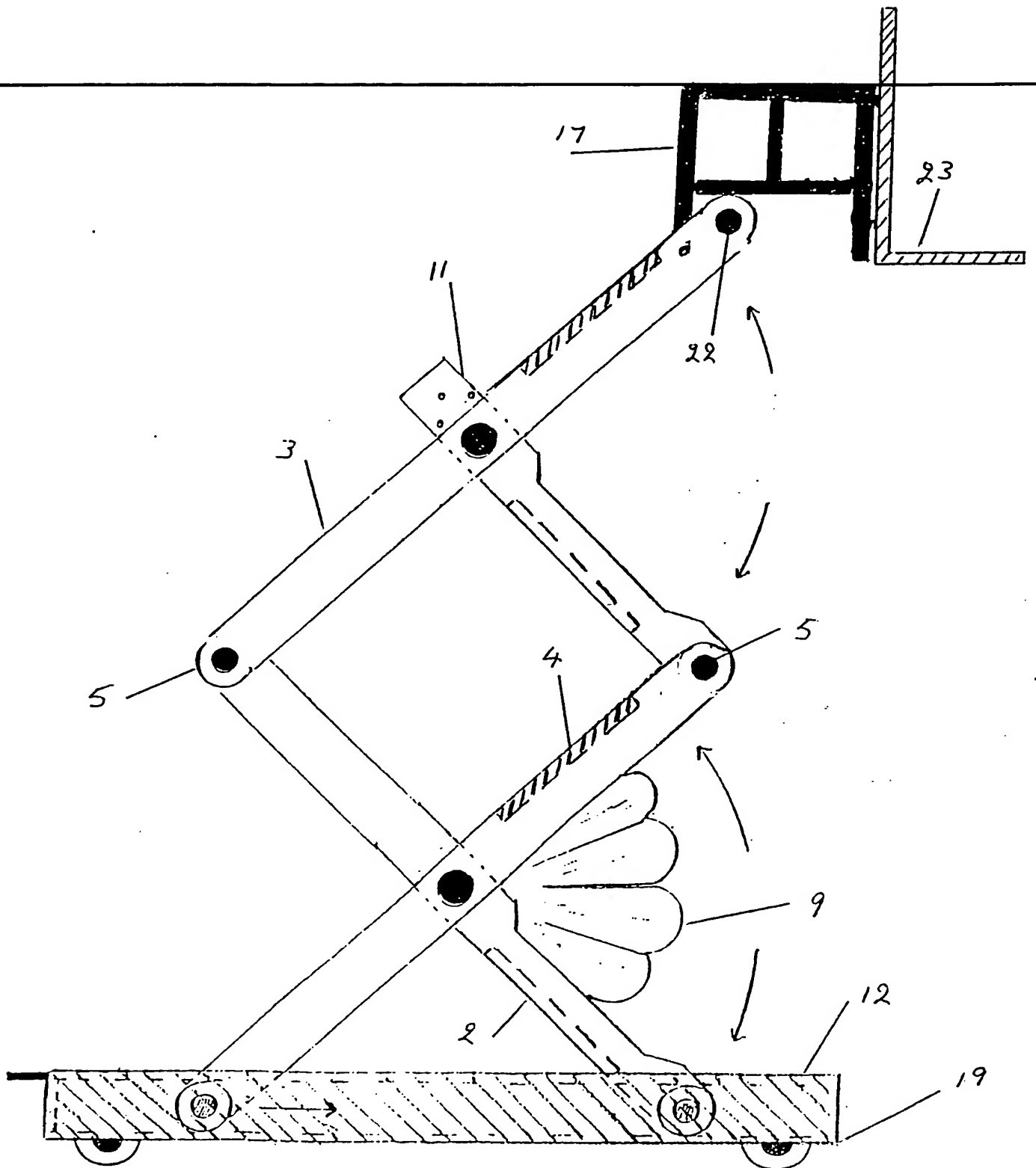


FIG 10

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